

**JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER**

Programme: B.Sc.

Semester: VI

**BIOCHEMISTRY PAPER VII
METABOLISM 2**

Course Code: 18VIBC7

No. of Hours: 45

COURSE OBJECTIVES:

Through this course, the student is imparted knowledge of:

- The concept of metabolism and energy flow in biological systems
- The metabolism of different biomolecules with an emphasis on proteins and nucleic acids and porphyrins
- The disorders associated with lack of metabolism of a particular species or its incomplete metabolism.

LEARNING OUTCOMES:

On completion of the course, the student should be able to

- Discuss anabolic and catabolic pathways in cellular metabolism.
- Understand the amino acid metabolism: transamination and its mechanism, transdeamination, biosynthesis of non-essential amino acids, biogenic amines, metabolism of ammonia, urea cycle.
- Understand the biosynthesis of purines and pyrimidines.
- Comprehend the importance of the erythropoietic process in life, biosynthesis of haemoglobin, bile pigments.
- Discuss amino acid, nucleic acid and porphyrin metabolic disorders.
- Understand the concepts of metabolic integration.
- Discuss the effects of metabolism during starvation.

UNIT I

Chapter 1.1. AMINO ACID METABOLISM

15 HRS

Overview of amino acid metabolism, general reactions of amino acid metabolism: transamination, mechanism and role of pyridoxal phosphate in transamination, deamination (oxidative and non-oxidative). Metabolism of ammonia: normal blood ammonia level, sources and transport of ammonia, toxicity and disposal of ammonia, urea cycle- regulation and its significance, fate of the urea cycle. Integration of urea cycle with transamination and Krebs cycle. Glucogenic and ketogenic amino acids. Biosynthesis of non-essential amino acids (glycine, alanine, cysteine, aspartate, glutamate, threonine, proline, asparagine, glutamine, serine). Biosynthesis of aromatic amino acids. Physiologically active amines : GABA, histamine, serotonin, epinephrine, norepinephrine, dopamine, polyamines (putrescine, spermine, spermidin): synthesis, functions and clinical significance. Metabolism and biological role of creatine. Activated methyl cycle.

Chapter 1.2 AMINO ACID METABOLIC DISORDERS

04 HRS

Disorders of urea cycle: Hyperammonemia I,II, Citrullinemia, Argininosuccinic aciduria, Hyperargininemia. Alkaptonuria (AKU), Phenylketonuria (PKU), albinism. Maple syrup disease. Case studies.

UNIT II

Chapter 2.1 NUCLEIC ACID METABOLISM

06 HRS

Purine nucleotides: Biosynthesis and regulation of purine nucleotides. Importance of multifunctional enzymes. Pyrimidine nucleotides: Biosynthesis and regulation of pyrimidine nucleotides. Salvage reactions. Major pathway of purine and pyrimidine catabolism. Inhibitors of thymidylate synthase and HGPRT.

Chapter 2.2 DISORDERS OF NUCLEIC ACID METABOLISM

03 HRS

Disorders of purine metabolism: Gout and its types, Lesch-Nyhan syndrome. Xanthinuria. Disorders of pyrimidine metabolism: Orotic aciduria and its types. Case studies.

UNIT III

Chapter 3.1 PORPHYRIN METABOLISM

06 HRS

Biosynthesis of heme. Degradation of heme. Circulation and excretion of bile pigments, conjugation of bilirubin with D-glucuronic acid in liver cells.

Chapter 3.2 DISORDERS OF PORPHYRIN METABOLISM

04 HRS

Porphyrias and its types – liver porphyria and Erythroid porphyria, Hyperbilirubinemia: Congenital hyperbilirubinemia - Crigler-Najar syndrome. Acquired hyperbilirubinemia - Jaundice and its types (Hemolytic, hepatic and obstructive), neonatal jaundice. Diagnosis and treatment of porphyrias and jaundice.

UNIT IV

Chapter 4.1 INTEGRATION OF METABOLISM

03 HRS

Integration of metabolism of Carbohydrates, Lipids and Proteins, Inter-conversion between three principle components, Regulation and Control of Reactions.

Chapter 4.2 METABOLISM IN STARVATION

04 HRS

Effects on metabolism. Changes in carbohydrate, protein and fat metabolism during fasting and fed conditions. Benefits of fasting and effect on ageing.

REFERENCES:

1. Debajyoti Das, Biochemistry 13th edition, Academic publishers 2008
2. J.L Jain, Sunjay Jain and Nitin Jain Fundamentals of Biochemistry 6th edition S. Chand & Company
3. U.Satyanarayana, Text book of Biochemistry, 2nd edition-Books and Allied private Limited.
4. David Nelson and M.Chael.M Cox, Lehninger Principles of Biochemistry, 6th edition W.H.Freeman and company Ltd.
5. Lubert Stryer, Biochemistry, 4th edition-W.H.Freeman and Co. New York.
6. Donald Voet and Judith G.Voet – Biochemistry, 3rd edition, John Wiley and Sons, INC.
7. Mitchell Fry, Essential Biochemistry for Medicine, 1st edition, 2010 John Wiley and Sons, Ltd.

BIOCHEMISTRY
VI SEMESTER PRACTICAL PAPER VII

DURATION: 3 HRS / WEEK

NO. OF UNITS: 15

1. Estimation of calcium in serum/ urine by ammonium oxalate method.
 2. Estimation of Urine creatinine by Jaffe's method
 3. Estimation of Haemoglobin by Drabkin method
 4. Assay of Serum Glutamate Oxaloacetate Transaminase (SGOT);
 5. Assay of Serum Glutamate Pyruvate Transaminase (SGPT)
 6. Estimation of serum bilirubin by Van der burg's method.
 7. Determination of titratable acidity in urine
 8. Determination of urinary ammonia by Nessler's method.
 9. Estimation of uric acid in serum/urine by Caraway's method
 10. Estimation of blood urea by Diacetylmonoxime method
- Repetition and Tests.

REFERENCES:

1. Varley, Alan, H, Gowenlock - Practical Biochemistry, 6th edition, 2002, CBS Publishers.
2. J. Jayaraman - Manual in Biochemistry, 2001, New Age International Publishers.
3. David Plummer - Practical Biochemistry, 3rd edition, 2017, McGraw Hill Publishers.
4. S.K. Sawhney, Randhir Singh - Introductory Practical Biochemistry, 2nd Edition, 2005, Narosa Publishing house